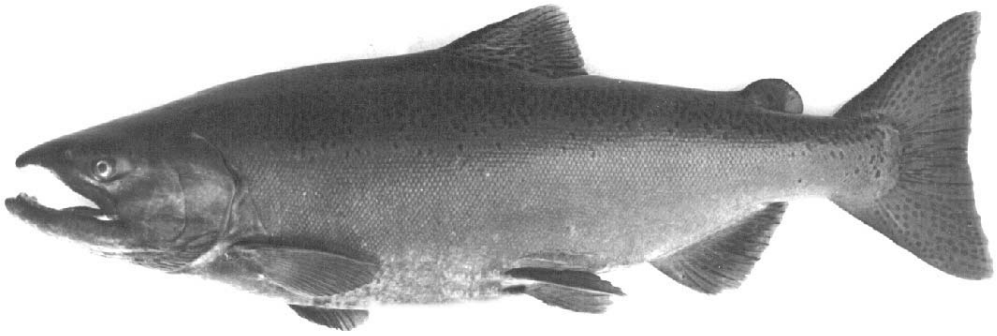
SKYKOMISH RIVER SUMMER CHINOOK



HATCHERY GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	The Tulalip Tribes Bernie Kai-Kai Gobin Salmon Hatchery
Species or Hatchery Stock:	Wallace River (Skykomish) Summer Chinook
Agency/Operator:	The Tulalip Tribes
Watershed and Region:	Tulalip Creek, WRIA Region 07
Date Submitted:	March 2, 2004
Date Last Updated:	March 2, 2004

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Bernie Kai-Kai Gobin Hatchery, Tulalip Summer Chinook

1.2) Species and population (or stock) under propagation, and ESA status.

Chinook salmon (*Oncorhynchus tshawyhtscha),* Skykomish Chinook, threatened

1.3) Responsible organization and individuals

Indicate lead contact and on-site operations staff lead.

Name (and title): Steven Young, Hatchery Manager
Agency or Tribe: The Tulalip Tribes
Address: 10610 Waterworks Road, Tulalip WA, 98271
Telephone: (360) 651-4550
Fax: (360) 651-4460
Email: syoung@tulalip.nsn.us

Name (and title): Mike Crewson, Fishery Enhancement Biologist
Agency or Tribe: Tulalip Tribes
Address: Natural Resources Division, Fisheries/Wildlife Department
7515 Totem Beach Rd.
Tulalip, WA. 98271
Telephone: (360) 651-4804
Fax: (360) 651-4490
Email: mcrewson@tulaliptribes-nsn.gov

Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

Egg takes will be conducted in cooperation with the Washington Department of Fish and Wildlife (WDFW) Wallace River Hatchery using native Skykomish River Chinook.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Funding sources are the Bureau of Indian Affairs and the Tulalip Tribes. Staffing levels will be four, full-time hatchery employees, one, eight month temporary employee, one four month temporary employee, and from one to twelve temporary workers during spawning, egg shocking and picking, fish transfers, and tagging operations. Operational costs will be

approximately $300,000 annually.

1.5) Location(s) of hatchery and associated facilities.

Tulalip Creek- WRIA 07.0001, RMPC Code- 3F10308 070001 R
Tulalip Salmon Hatchery- WRIA 07.0001, RMPC Code- 3F10308 070001 H

Tulalip Tribes Bernie Kai-Kai Gobin Salmon Hatchery:
10610 Waterworks Road
Tulalip, WA 98271

The Kai-Kai Gobin Salmon Hatchery is located at the juncture of the east and west forks of Tulalip Creek just above the point at which Tulalip Creek feeds into Tony's Marsh, river kilometer 2.0.

Upper Tulalip Creek Pond:

The upper Tulalip Creek pond near is located near to:
7615 Totem Beach Rd.
Tulalip, WA. 98271

The upper pond is located in WRIA 7, stream number 0001, river kilometer 0.1., behind a dam just upstream from the lower Tulalip Creek pond, which drains directly into Tulalip Bay via a fish ladder, and/or a valved pond drain line. Anadromous fish passage is prevented above the lower Tulalip Creek pond.

Lower Tulalip Creek pond and spawning station:

The lower Tulalip Creek pond and spawning station is also located near to:
7615 Totem Beach Rd.
Tulalip, WA. 98271

The Lower Tulalip Creek release pond is located in WRIA 7, Stream 0001, stream kilometer 0.0., just downstream from the upper Tulalip Creek pond, which feeds it via a screened outlet structure and a fish release/screened outlet structure from upper to lower Tulalip Creek ponds.

Battle (Mission) Creek rearing pond and spawning station:

The Battle Creek rearing pond and spawning station is located near to:
7615 Totem Beach Rd.
Tulalip, WA. 98271

The Battle Creek rearing and release pond is located in Battle Creek approximately 200

meters upstream from Tulalip Bay in WRIA 7, Stream number 0005, stream kilometer 0.2.

1.6) Type of program.

Isolated Harvest.

1.7) Purpose (Goal) of program.

The purpose of this program is to provide Chinook salmon for harvest by Tulalip Tribal members in a terminal area fishery. Production from this program is also available for harvest by the non-Indian sport fishery and contributes to other directed and incidental Treaty/non-Treaty harvest of Chinook salmon in fisheries in southeast Alaska, British Columbia, Washington coast, and Puget Sound preterminal areas.

This HGMP reflects a major change in the primary source of Chinook broodstock for the Tulalip enhancement program from exogenous fall Chinook to native Skykomish River Chinook returning to the Wallace River Hatchery, located on the Skykomish River. The hatchery fall Chinook stock is originally not native to the Skykomish River (they are of Green River origin). Summer Chinook are native Skykomish River stock.

Effective with the 2003 return, the primary source of Chinook broodstock for the Tulalip enhancement program will change from late-run falls to earlier-timed Skykomish Chinook. This change will reverse the current program, and a new 2003 State-Tulalip MOU agreement was signed by the Co-managers. Changes in broodstock source and numbers described in this HGMP and in the MOU Agreement were also submitted to the Future Brood Document in 2003.

We will continue to coded-wire tag approximately 100,000 Skykomish Chinook and approximately 100,000 late-run Chinook per year, collected at the Wallace River Hatchery whenever possible, with annual targeted total release numbers of 200,000 and 1,500,000, early- and late-run Chinook fingerlings, respectively. Results from this study will provide analyses of comparative survival, contribution to directed and incidental fisheries, straying, and comparative incidental impacts on other listed Chinook stocks while harvesting each of these two stock components.

1.8) Justification for the program.

Shifting primary enhancement efforts to this locally-adapted, native stock will provide an alternative to the fall Chinook stock, originally of Green River origin, or other out-of-basin Chinook stocks, that have been used in the past as the primary source of fall Chinook broodstock for this program. This is the stock now being reared at the Washington State Department of Fish and Wildlife Wallace River Hatchery. Fall Chinook releases were discontinued at the Wallace River Hatchery after brood year 1996.

The Tulalip summer Chinook stock is classified as a secondary management unit in all areas, except 8D, where the fishery is managed to target Tulalip Chinook while minimizing interceptions of other Chinook stocks (see the annual Stillaguamish/Snohomish status reports). All summer and fall Chinook salmon production from Bernie Kai-Kai Gobin Hatchery will receive unique thermal otolith marks by their stock of origin, and 100,000 of each stock will be adipose fin-clipped and coded-wire tagged annually so that hatchery returns originating from each stock can be identified in terminal fisheries and on their natural spawning grounds. The Stillaguamish and Snohomish natural summer/fall Chinook are primary management units.

Thus the intent of this research program is to provide a source of broodstock for the Tulalip Tribes' Chinook program that utilizes the native Skykomish River stock and is more likely to be genetically and ecologically similar to the locally-adapted Chinook populations inhabiting the Snohomish basin.

Until listed wild stocks are recovered, hatchery production will continue to provide a harvestable surplus of Chinook for Tulalip Tribal fisheries. This program is limited to a maximum release of 1,500,000 fingerling smolts each year.

1.9) List of program "Performance Standards".

1) Assure a continuing ceremonial, subsistence, and commercial harvest of Chinook salmon for the fishers of the Tulalip Tribes in a terminal area fishery is the primary performance standard for this program. Production from this program is also available for harvest by the non-Indian sport fishery and contributes to other directed and incidental harvest of Chinook salmon in fisheries in southeast Alaska, British Columbia, and Puget Sound preterminal areas as a secondary performance standard.

2) The tagged portion of this production release will allow for ongoing comparisons of post-release survival, contribution to fisheries, straying, and incidental impacts to other listed salmon populations while directing harvest at the summer and fall Chinook stock components, as a third performance standard.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

Please see the performance standards in Section 1.9 above. Note, annual accomplishment of research, monitoring, and evaluation projects listed throughout this HGMP and in performance standards and indicators is contingent on availability of funding. As of 2004, most hatchery reform and HGMP monitoring projects have been accomplished primarily through acquiring Hatchery Reform and self-governance funds specifically dedicated for hatchery reform and rehabilitation.

Goal (Section 1.7-1.8)	**Performance Standard** (Section 1.9)	**Performance Indicator** (Section 1.10)
Provide ceremonial, subsistence, and commercial, harvest opportunities for Tulalip Tribal terminal area fishery. Provide commercial and recreational harvest opportunities for Treaty and non-Treaty fishers in pre-terminal areas.	Hatchery return provides opportunity for weekly three-day Tulalip Tribal opening for Chinook salmon in Area 8D as well as a directed non-Treaty sport fishery in the same area.	On average the estimate of survival rate for the hatchery production remains above 0.005 to provide: • for the recruitment of 10,000 December Age 3 Chinook, and • an average terminal harvest rate of > 0.95
Compare in-hatchery and post-release survival of native and exogenous Chinook reared at the Tulalip Hatchery.	Survival rates of summer Chinook compare favorably with those of Tulalip fall Chinook.	▪ The overall survival rate of summer Chinook is not less than the survival rate for fall Chinook ($p < 0.10$; chi square).
Compare incidental impacts to other listed salmon populations while targeting harvest on program fish in the terminal fishery.	Pre-terminal harvest directed at Tulalip Chinook does not unduly impact listed wild populations when considered in conjunction with all other harvest-related impacts on these populations.	▪ Annual fishery plans project exploitation rates below the Co-managers' guidelines for all Puget Sound Chinook management units. ▪ Post-season assessments of exploitation rates on Stillaguamish and Snohomish Chinook are below the Co-managers' guidelines.
Provide the broodstock needed to maintain the Tribal and State hatcheries and Tribal fishery.	See the Wallace River Hatchery HGMP	See the Wallace River Hatchery HGMP

Goal (Section 1.7-1.8)	Performance Standard (Section 1.9)	Performance Indicator (Section 1.10)
Limit genetic and ecological impacts of program fish to natural Chinook population to acceptable levels. Compare adult straying, return timing, and juvenile ecological interactions among the two Chinook stock components.	The hatchery production does not contribute significantly to the naturally-spawning population. Contribution of program Chinook released into Tulalip Bay do not return and contribute to the natural Chinook escapement in local, listed populations at a rate greater than previously measured for exogenous fall Chinook.	The proportion of Tulalip-origin spawners in the natural spawning areas remains below Co-managers' guidelines.
	Broodstock collection shall be carried out without any risks to natural populations.	See the Wallace River Hatchery HGMP.
	Release practices do not impact natural production.	Evaluate the level of interaction of hatchery-origin summer Chinook smolts released into Tulalip Bay releases with natural-origin, juvenile Chinook in estuarine and nearshore habitats. Test the hypothesis that the time of peak abundance of Tulalip summer Chinook salmon and naturally-produced Chinook salmon in Tulalip Bay do not differ significantly.

1.11) Expected size of program.

The expected size of this program is 1,500,000 smolts released at a size of 75 fish per pound.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

No Chinook broodstock will be collected at the Tulalip Hatchery or from natural populations. Hatchery returns of native Skykomish stock origin, as observed by possession of adipose fin clips and/or coded-wire tags, will be selected for broodstock at the Wallace River Hatchery. A total of 1.6 million eyed, Skykomish Chinook stock will be transferred annually from the WDFW Wallace River Hatchery to Tulalip. A 2003 State-Tulalip Tribal MOU (February 10, 2004) describes understandings and agreements concerning Chinook culture programs of the Tulalip Bernie Kai-Kai Gobin Salmon Hatchery, operated by the Tulalip Tribes, and the Wallace River Hatchery, operated by WDFW. This MOU describes specific contingency plans to collect additional Chinook to supplement the production eyed egg take goal for Skykomish Chinook of 1.6 million on poor return years when egg shortfalls might occur (See Section 6; Broodstock Origin and Identity, for further details).

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level

Life Stage	Release Location	Annual Release Level
Fingerling (smolt)	Tulalip Bay	1,500,000

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

a) Smolt-to-adult survival: Please see the Wallace River WDFW HGMP. While no adult returns have been completely reconstructed by brood year for summer Chinook releases, we expect the smolt-to-adult survival rate to exceed 0.5% annually.

b) Adult production levels: Please see the Wallace River WDFW HGMP. At a 0.5% survival rate, of a production release of 1,500,000 smolts, a return of approximately 7,500 adult Chinook to Tulalip Bay might be expected.

c) Escapement levels: Please see the Wallace River WDFW HGMP. All program fish returning to Tulalip Bay will be targeted for harvest, and the only program fish that might return to the Snohomish basin will be a very small proportion of the Tulalip Bay release comprised of native stock. At a fecundity of approximately 4,000 eggs per female, an escapement to the hatchery of 425 females and approximately an equal number of males (900 total broodstock, or 1,000 returns less 10% holding mortality) will be required to produce 1,700,000 green eggs or 1,600,000 eyed eggs. At this fecundity, the total number of females needed to produce 3.5 million eggs for the on-station release and egg transfer goal to Tulalip is approximately 975 females or 1,950 total broodstock assuming a 1:1 sex ratio.

1.13) Date program started (years in operation), or is expected to start.

Chinook production utilizing native Skykomish stock began in brood year 1998 at the Wallace River Hatchery. From the 1998 return through the 2002 return, egg take and release levels remained low (egg takes were 200,000 eyed eggs, mean fish release levels (mean ± SEM) were 171,634 ± 18,218, range 117,315 to 195,000 fingerlings, among collection years. Beginning with brood year 2003, full production will be initiated (culture of 1.6 million eyed eggs, with a release goal of 1.5 million juvenile summer Chinook).

1.14) Expected duration of program.

Presuming that this program proves to be a success in terms of fish health and survival during hatchery culture, good post-release survival, proper timing for harvest management, low straying rates and incidental impacts to other listed Chinook stocks or other salmon stocks of concern, availability of eggs, and other considerations, marked and/or tagged

hatchery Chinook returns of Skykomish River-origin will be a permanent replacement production stock for the Tulalip enhancement program.

1.15) Watersheds targeted by program.

The watershed targeted by program is Tulalip Creek, WRIA 7, stream number 0001.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

This shift toward hatchery Chinook returns of native Skykomish origin as the primary source of broodstock for production releases by the Tulalip Tribes is an alternative action to attain the Tribe's program goals, and no other alternative actions are being contemplated at this time. However, this HGMP is an evolving plan that will continue to incorporate adaptive management and decision-making based upon monitoring, evaluation, and research before and after program fish are released to optimize viability of natural and hatchery populations.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

This HGMP is being developed to provide the basis for an incidental take permit under a 4(d) rule.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

Threatened populations of Chinook salmon within the Puget Sound ESU, including north and south fork Stillaguamish, Snoqualmie, and Skykomish Chinook may potentially be affected by this program. The status and delineation of these populations is tentative pending completion of final population delineation for the Puget Sound ESU (please see the Wallace River broodstock anticipated levels of take). Other take actions might include competition between listed natural Chinook and hatchery-origin Chinook in estuarine and nearshore areas upon release.

Juvenile estuarine and nearshore residency of listed Puget Sound Chinook salmon may temporally and spatially overlap with habitats utilized by Skykomish Chinook juveniles released by this program. Potential competitive effects are unknown at this time. Out-migration studies, which are currently underway in the Snohomish and Stillaguamish

systems, will provide better information on the timing of hatchery-origin Chinook and local, listed, juvenile Chinook inhabiting estuarine and nearshore habitats, so that we can assess the extent to which any overlap may occur with program fish.

- Identify the ESA-listed population(s) that will be directly affected by the program.

None.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

Snohomish and Stillaguamish basin naturally-spawning Chinook stocks may be incidentally affected by this program.

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

-Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds

Currently, listed Chinook salmon populations from the Stillaguamish basin (North Fork Stillaguamish and South Fork Stillaguamish) and Snohomish basin (Skykomish and Snoqualmie rivers) are above critical thresholds. All four populations are at levels substantially below the Co-managers' recovery goals. Both the Stillaguamish and Snohomish watersheds have active recovery planning groups developing Chinook recovery plans, which will include actions in the areas of harvest, hatchery, and habitat management.

- Provide the most recent 12-year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

Table 4. Reconstruction of total recruitment and recruits per spawner (Rawson 2000) for Stillaguamish summer Chinook.

Brood Year	Escapement	Brood Year Escapement	Brood Year Exploitation Rate	Brood Year Recruitment	Recruits Per Spawner
1986	980	505	0.66	1505	1.54
1987	1065	695	0.46	1278	1.2
1988	516	654	0.64	1832	3.55
1989	510	458	0.82	2544	4.99
1990	585	488	0.67	1457	2.53
1991	1331	486	0.53	1040	0.78
1992	466	496	0.38	959	2.06
1993	563	585	0.5	1165	2.07

Provide the most recent 12-year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Natural Chinook escapement in the Stillaguamish basin over the past 12 years.

Year	Summer (N. Fork)	Fall (S. Fork)	Total
1991	1,331	301	1,632
1992	486	294	780
1993	583	345	928
1994	667	287	954
1995	599	223	822
1996	993	251	1,244
1997	930	226	1,156
1998	1,292	248	1,540
1999	845	253	1,098
2000	1,403	243	1,646
2001	1,066	283	1,349
2002	1,196	393	1,589

SOURCE: WDFW (2002 estimates preliminary)

Natural Chinook escapement in the Snohomish basin over the past 12 years.

Year	Skykomish	Snoqualmie	Total
1991	2,192	628	2,820
1992	2,002	706	2,708
1993	1,653	2,366	4,019
1994	2,898	728	3,626
1995	2,791	385	3,176
1996	3,819	1,032	4,851
1997	2,355	1,937	4,292
1998	4,412	1,892	6,304
1999	3,455	1,344	4,799
2000	4,665	1,427	6,092
2001	4,575	3,589	8,164
2002	4,224	2,996	7,220

SOURCE: WDFW (2002 estimates preliminary)

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

These data are not yet available. To date, only partial coded-wire tagged and otolith-marked adult returns are available from this program. A sufficient number (approximately 100,000 pre-smolts) of the summer Chinook hatchery production will continue to be adipose fin-clipped and coded-wire tagged, and all eggs will be differentially, otolith mass-marked, to allow for abundance estimation of the summer run stock component post-release. Assessment of adult stray rates to natural spawning areas will be based upon sampling of carcasses and reading of otoliths according to the methods described in Rawson et al. (2001) and also by coded-wire tag recoveries. Also, please see the Tulalip fall Chinook HGMP for initial results of straying studies on Tulalip fall Chinook for identical methodology that will be employed to assess stray rates for the summer stock component.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.

-Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Please see the WDFW HGMP for the Wallace River Hatchery for potential incidental effects of broodstock collection on listed populations.

Juvenile estuarine and nearshore residency of listed Puget Sound Chinook salmon may overlap with juveniles released by this program. Potential competitive effects are unknown at this time. Chinook smolt out-migration studies are currently underway in the Snohomish and Stillaguamish systems. These studies will provide better information on the timing of local listed populations so that we can assess the extent to which any overlap might occur with program fish. Adult, ESA-listed fish may be incidentally-impacted by harvest directed at program Chinook in the Tulalip Bay terminal fishery and/or by broodstocking activities at a relatively low extent, which is the purpose of the marking, tagging, and post-release catch and survival study.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

None.

Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

Please see the WDFW HGMP for the Wallace River Hatchery for incidental effects of broodstock collection on listed populations.

The extent of possible adverse competitive effects of hatchery juveniles on listed populations of Puget Sound Chinook is not quantified at this time, but is thought to be low.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Please see the WDFW HGMP for the Wallace River Hatchery for incidental effects of broodstock collection on listed populations and associated contingency plans.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations

from the plan or policies.

Not applicable. An ESU-wide hatchery plan for Puget Sound Chinook is currently being developed.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

The Puget Sound Salmon Management Plan (PSSMP 1985) sets out the legal framework under which co-management of hatchery programs occurs. Programs at the Bernie Kai-Kai Gobin Hatchery are included in the Stillaguamish/Snohomish Equilibrium Brood Document, which is currently in draft form only. Annual production levels are agreed to by the Co-managers and are described in the Future Brood Planning Document. Hatchery escapement goals and terminal area harvest management plans are described in the annual Stillaguamish/Snohomish regional status report (available approximately July 1 each year).

The basic agreements between WDFW and the Tulalip Tribes concerning the operation of the Bernie Kai-Kai Gobin Hatchery were set forth in a memorandum of understanding dated May 29, 1981. A memorandum of understanding between the Tulalip Tribes and the WDFW (August 26, 1997) described changes in the Chinook program that were agreed to at that time. A recent memorandum of understanding between the Tulalip Tribes and the WDFW (February 10, 2003) describes current understandings and agreements concerning summer and fall Chinook culture programs of the Tulalip Bernie Kai-Kai Gobin Salmon Hatchery, operated by the Tulalip Tribes, and the Wallace River Hatchery, operated by WDFW. This MOU describes the shift to using marked/tagged hatchery returns of native Skykomish Chinook origin from exogenous fall stock as the primary production broodstock source at the Wallace River Hatchery and specific contingency plans to collect additional Chinook to supplement hatchery Chinook returns on years when Skykomish Chinook egg shortfalls might occur (See Section 6; Broodstock Origin and Identity, for further details).

3.3) Relationship to harvest objectives.

The Co-managers are also following a harvest management plan for Puget Sound Chinook salmon. The National Marine Fisheries Service initially issued biological opinions for salmon fisheries within Puget Sound conducted between May 1, 2000, and April 30, 2003, concluding that these fisheries did not create jeopardy to listed Puget Sound Chinook salmon. Currently, the Co-managers recently submitted a plan for fisheries to be conducted between May 1, 2004, and April 30, 2009, for consideration by NOAAF. This *Co-managers' Puget Sound Chinook Harvest Management Plan* (February 21, 2003) lists harvest management objectives for each Puget Sound Chinook management unit. All operations of the Bernie Kai-Kai Gobin Hatchery are consistent with the above plans. Harvest of Chinook released by the Tulalip enhancement program will be conducted in

terminal area 8D where hatchery fish have largely separated from other listed stocks as they return to their point of release in Tulalip Bay (Rawson, Kraemer, and Volk 2001). The Tulalip Tribes utilize time and area management and pulse fisheries to focus harvest on hatchery fish.

These methods will continue to be evaluated through sampling of the terminal area fishery for otoliths and coded-wire tags. A thermal mark has been placed on all Tulalip Chinook production, beginning with a unique mark for the fall stock in brood year 1993. A new, differential mark has been placed on all Skykomish Chinook hatchery stock released at the Bernie Kai-Kai Gobin Hatchery, beginning in brood year 1999. In addition, 100,000 fingerlings from each stock have received unique CWT's since comparative releases were initiated with the 1998 brood. We will continue to place differential, thermal marks on otoliths of 100% of these two stocks.

The contribution of hatchery fall Chinook production releases to the total Chinook harvest in Tulalip Bay has ranged from 90% to 96% in the most recent five years observed (1997 to 2001; Rawson, Kraemer, and Volk 2001 and the table below). Only limited information is currently available for Skykomish hatchery Chinook released by the Tulalip enhancement program, because the first release of mass thermally-marked Skykomish Chinook from the Bernie Kai-Kai Gobin Hatchery were initiated in 1999 (from brood year 1998). Since fall Chinook have been cultured and released longer than the native Skykomish stock, more complete data are available on their contribution to the terminal area fishery. Initial results from fall Chinook otolith marking and recovery are as follows:

Estimates of the contribution of Tulalip Hatchery Chinook to the Area 8D fishery based on recoveries of thermally-marked otoliths and coded-wire tags, 1997-2002.

Return Year	Hatchery Contribution
1997	91%
1998	93%
1999	96%
2000	90%
2001	94%
2002	94%

The above information has been incorporated into the Co-managers' Fishery Regulation Assessment Model (FRAM) so that incidental harvest of listed populations in Area 8D will be included with all other incidental harvest of listed populations (K. Rawson pers. comm.).

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

The only fisheries directed at Tulalip fall Chinook are conducted in terminal Area 8D during the time that adult hatchery fish return to Tulalip Bay (approximately mid-July through September each year). The Tulalip Tribes open a net fishery for Tribal members three days per week. The Washington Department of Fish and Wildlife (WDFW) opens a recreational hook and line fishery, also three days a week. Catch in the net fishery is recorded on fish tickets, and catch in the sport fishery is estimated by angler interviews and aerial surveys conducted by the WDFW. Catch estimates for the past twelve years are as follows:

Year	Area 8D Net	Area 8D Sport
1988	1,405	*
1989	2,438	*
1990	4,220	*
1991	4,001	*
1992	3,102	*
1993	3,714	*
1994	4,688	1,404
1995	8,013	2,279
1996	11,386	2,791
1997	8,376	2,902
1998	7,125	*
1999	15,368	511
2000	7,663	1,192
2001	6,062	1,708
2002	5,465	**

*No Tulalip special area fishery this year.
** Estimates not yet available.

Harvest rates on program Chinook released by the Tulalip enhancement program will be managed to be as close to 100% as possible. This is possible because adults return to Tulalip Bay, which does not house any other spawning populations of anadromous salmon, where hatchery returns concentrate and are targeted by the fishery. Actual harvest rates on Tulalip fall Chinook have been in the range of 90% to 100% for the past 12 years. Future management of Tulalip summer Chinook will continue to focus on harvesting as close as possible to 100% of the hatchery production while minimizing the impact of fisheries directed at hatchery-produced fish on listed populations. We will continue to thermally mass-mark this production and sample fisheries for otoliths to evaluate the success of our management at achieving these objectives. Additionally, a portion of this production (currently 100,000 fingerlings) will be coded-wire tagged, funding permitting, to provide additional data on fishery contribution and otolith mark recognition quality assurance.

Exploitation rates on listed populations are evaluated by the Co-managers based on total exploitation in all fisheries as described in the Co-managers' Puget Sound Chinook Management Plan. The contribution of incidental harvest of listed populations in the Area 8D fishery to overall exploitation rates is estimated with the FRAM model, which has been calibrated based on recent years' otolith samples and recoveries of coded-wire tags. In

future years, we anticipate that overall exploitation rates on listed populations affected by the Area 8D fishery will be less than the Co-managers' guidelines. We will continually evaluate exploitation of these populations in the Area 8D fishery through ongoing collection of otolith and coded-wire tag data.

3.4) Relationship to habitat protection and recovery strategies.

Work groups in the Stillaguamish and Snohomish watersheds are currently in the process of assessing the major factors affecting natural salmon production and are developing habitat management plans to facilitate Chinook salmon recovery. Initial recommendations for the Snohomish basin are described in the *Initial Snohomish River Basin Chinook Salmon Conservation /Recovery Technical Work Plan (October 6, 1999).* The Co-managers are also following a harvest management plan for Puget Sound Chinook salmon. The National Marine Fisheries Service initially issued biological opinions for salmon fisheries within Puget Sound conducted between May 1, 2000, and April 30, 2003, concluding that these fisheries did not create jeopardy to listed Puget Sound Chinook salmon. Currently, the Co-managers recently submitted a plan for fisheries to be conducted between May 1, 2004, and April 30, 2009, for consideration by NOAAF. This *Co-managers' Puget Sound Chinook Harvest Management Plan* (February 21, 2003) lists harvest management objectives for each Puget Sound Chinook management unit. All operations of the Bernie Kai-Kai Gobin Hatchery are consistent with the above plans.

3.5) Ecological interactions.

Predators, such as river otters, mergansers, cormorants, staghorn sculpin, cutthroat trout, and dolly varden trout are occasionally observed consuming juvenile salmon in their final grow-out pond in Tulalip Creek and after they are released into Tulalip Bay. The ecological impacts of these summer Chinook salmon on other species in estuarine or marine waters is unknown.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Well water, and/or creek water will be used at the Wallace River Hatchery for incubation of summer Chinook eggs to the eyed stage, then Tulalip Hatchery well water will be used to incubate the eyed eggs until hatching and subsequent alevins will remain on well water until they are ready to pond. After swim up fry are ponded, combined flows of the east and west forks of Tulalip Creek will comprise the influents for early rearing raceways and other larger raceways and hatchery ponds specifically designated for rearing juvenile Chinook, before they are transferred into the lower Tulalip Creek pond (supplied by Tulalip Creek surface water) until their release directly into Tulalip Bay.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Water withdrawal and screening do not affect listed natural fish because there are no listed salmon present in Tulalip Creek. Effluent discharge is highly unlikely to affect listed natural fish in marine waters adjacent to the outlet of Tulalip Creek. The effect, if any, is not quantified, but catch data suggest that greater than 90% of all adult Chinook in Tulalip Bay are unlisted hatchery fish.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock will be collected and sorted by return timing into three holding and ripening ponds at the Wallace River Hatchery. The Wallace River is located within WRIA 7, stream number 0942. The Wallace River Hatchery is located at river mile 4.0 of the Wallace River, and stream mile 0.0 of May Creek. In the past at the Wallace River Hatchery, summer Chinook were distinguished from fall Chinook based upon their return timing back to the Wallace River facility. Generally, Chinook returning before mid- to late-August were taken as summer Chinook, and after September 1 as fall Chinook, but these dates shifted somewhat from year to year depending on run timing, which in turn was believed to be affected by marine and river harvest patterns, river flows and possibly other factors. The expectation now is that since all fall Chinook releases from the Wallace River Hatchery were completely discontinued after brood year 1997, and since then, nearly all hatchery stock have been either adipose-mass marked and/or coded-wire tagged denoting their Skykomish summer stock origin, all marked/tagged hatchery returns in the future will be of summer stock origin.

Fertilized summer Chinook eggs taken at the Wallace River Hatchery will be incubated in Heath incubators on May Creek (WRIA 7, stream number 0944) surface water to the eyed stage. They will then be shocked, mortalities picked, and the healthy eyed eggs will be transported to the Bernie Kai-Kai Gobin Tulalip Tribal Salmon Hatchery. After their disinfection with buffered iodophor, they will be incubated on Tulalip Hatchery well water.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Eyed eggs will be transported from the Wallace River Hatchery to the Bernie Kai-Kai Gobin Hatchery in clean, wet, burlap sacks, which will be insulated from the wind and cold during the transport.

5.3) Broodstock holding and spawning facilities.

Please see the WDFW Wallace River Hatchery HGMP.

5.4) Incubation facilities.

At the Wallace River and Tulalip Hatcheries, Skykomish River summer Chinook will be incubated in Heath vertical stack incubators. At the Wallace River Hatchery, these incubators are sixteen trays high. At the Tulalip Hatchery, the incubators are eight trays high.

5.5) Rearing facilities.

Skykomish Chinook will be reared at the Tulalip Hatchery and lower Tulalip Creek pond. Upon emergence, swim up fry will be ponded outside in early rearing troughs at the Tulalip Hatchery, where they will be reared to a weight of approximately 400 fish per pound (just above one gram whole body weight). Due to rearing space limitations at the Tulalip Hatchery, Chinook fry will then be transferred to larger raceways or a large concrete pond specifically designated for rearing juvenile Chinook. After coded-wire tagging in mid-April each year, Chinook will be transferred to the lower Tulalip Creek pond.

5.6) Acclimation/release facilities.

Lower Tulalip Creek pond functions as an acclimation and final rearing pond for this stock. It is an earthen pond which gives the juvenile Chinook a much more natural environment prior to release. In this pond, Chinook fingerlings learn to prey upon live organisms, and learn to avoid natural predators. The pond is created by a dam and screened fish ladder on the downstream end. It is oval-shaped, and is approximately 160 feet wide by 120 feet long. Its depth varies from zero at the shoreline to approximately five meters deep in the center portion of the pond.

To provide identical rearing conditions after coded-wire tagging for the two experimental release groups, fall Chinook will be ponded with the summer stock prior to their release, which is designed to measure their comparative survival. Summer and fall Chinook will be reared in this pond until they reach a weight of 75 fish per pound (approximately six grams). This occurs in early- to mid-May each year, when they are released at high tide into Tulalip Bay.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

None.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission,

or other events that could lead to injury or mortality.

1) All phases of the culture operation from handling broodstock, to spawning, egg fertilization and incubation, and fish rearing will be supervised by properly-trained hatchery workers.

2) The stock will be reared in a location (Tulalip Creek) that is remote from naturally-spawning Snohomish River Chinook stocks, and thus can't be accidentally released into the river with them.

3) The incubation systems of the Wallace and Tulalip Hatcheries are equipped with low water alarms and back-up water supplies.

4) Both hatcheries have well trained staff on duty 24 hours per day, seven days per week.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

Adult hatchery Chinook returns to the Wallace River Hatchery will continue to be mass-marked and/or coded-wire tagged to denote their origin, and will be identifiable as program fish originally of native Skykomish River stock origin. Since brood year 2000, WDFW has fully funded an indicator stock program using summer Chinook fingerling production at Wallace River Hatchery. If fingerling production at Wallace River hatchery is mass-marked with an adipose finclip then this program will involve coded-wire tagging of 200,000 of the fingerling release with an adipose fin clip and coded-wire tagging of an additional 200,000 of the fingerling release
without the adipose fin clip.

In the past, Chinook returning to the hatchery before mid- to late-August were assumed to be summer Chinook, and after September 1st as fall Chinook, but these dates shifted somewhat from year to year depending on run timing, which in turn was believed to be affected by marine and river harvest patterns, river flows and possibly other factors. The expectation now is that since all fall Chinook releases from the Wallace River Hatchery were completely discontinued after brood year 1996, and since then, all hatchery stock released on-station have been either adipose-mass marked and/or coded-wire tagged denoting their Skykomish summer stock origin, all marked/tagged hatchery returns in the future will be of summer stock origin.

6.2) Supporting information.

6.2.1) History.

Please see above.

6.2.2) Annual size.

The annual egg take goal for this program will increase from 200,000 to 1.6 million eyed Skykomish Chinook eggs, that are representative of the abundance, return and spawn timing of natural-origin Chinook in the Skykomish basin, for a release of approximately 1.5 million summer and 200,000 fall Chinook fingerlings annually into Tulalip Bay.

Besides decreasing the fall Chinook egg take goal, this shift toward summer from fall Chinook production at the Tulalip facility will increase the required summer Chinook egg take at the Wallace River Hatchery. However, it is anticipated that current Skykomish summer Chinook fingerling release levels will be adequate to provide adult returns for use as broodstock at levels sufficient to meet the increased egg take goal. Therefore, the on-station release numbers at Wallace River Hatchery will remain at one million fingerling and 250,000 yearling Skykomish summer Chinook annually. The WDFW will manage for sufficient Skykomish Chinook adult returns to the Wallace River Hatchery traps to meet the egg take goal for the combined on-station and Tulalip Chinook salmon fingerling enhancement programs.

Given the above on-station release goals and the new eyed egg transfer goal of 1.6 million eyed summer Chinook eggs to Tulalip, the Skykomish Chinook egg take goal at the Wallace River Hatchery will be 3.5 million green Skykomish River Chinook eggs and 200,000 late-run eyed Chinook eggs annually. The egg take from native Skykomish Chinook returns will be adjusted by the Co-managers if it is not sufficient to meet on-station release and eyed egg transfer goals.

In further recognition that there may be shortfalls of Skykomish River Chinook eggs on low return years to provide eggs for on-station releases and for the 1.6 million eyed egg transfer to the Tulalip Hatchery, this HGMP here reflects the contingency plan to collect additional later-timed Chinook returning to the Skykomish basin, beyond the experimental 200,000 eyed egg take, to supplement any shortfalls in the production egg take of native stock.

After making every effort to collect enough Skykomish Chinook eggs to meet on-station and production egg transfer goals to Tulalip, if it is still not possible to collect enough eggs within the basin, a secondary contingency plan, developed by the Co-managers in the 2003 Chinook hatchery MOU Agreement, describes the intent to collect additional Chinook eggs from other WDFW facilities if necessary.

Please see the WDFW HGMP for the Wallace River Hatchery for more broodstock collection information. A sufficient proportion (100,000 fingerlings) of the summer Chinook hatchery production released into the Snohomish basin will be both adipose fin-

clipped and coded-wire tagged, the additional production will be either adipose clipped and/or CWT'ed, and all eggs will be differentially otolith mass-marked, to enable population abundance estimation for this stock component. Assessment of adult stray rates to natural spawning areas will be based upon sampling of carcasses and reading of otoliths according to the methods described in Rawson et al. (2001) and by recovery of coded-wire tags.

6.2.3) Past and proposed level of natural fish in broodstock.

See the WDFW HGMP for the Wallace River Hatchery.

6.2.4) Genetic or ecological differences.

These are the questions, in part, that the comparative tagged and otolith-marked release of summer and fall Chinook is designed to answer.

6.2.5) Reasons for choosing.

Skykomish summer Chinook are native to the Snohomish basin and are the locally-adapted Chinook stock. This stock was chosen to replace the fall Chinook stock, of Green River origin, which has been the primary Chinook stock cultured and released from the Wallace River Hatchery. This choice will minimize or eliminate genetic and ecological differences between program fish and natural-origin Chinook in the Snohomish basin.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

The rearing of this stock at the Tulalip Salmon Hatchery is being done to test the wisdom of changing our Chinook production program to a largely indigenous stock. Only by relative comparison with the previously-used fall stock, can any differences in return timing, contribution to directed fisheries, incidental fishery impacts to other primary management units, survival rates, or straying be understood, or to evaluate what impact this shift in broodstock may have to the Tulalip Tribes' harvest and hatchery programs.

SECTION 7. BROODSTOCK COLLECTION

See the Wallace River Hatchery HGMP for broodstocking protocols.

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Eggs will be provided for this program from the Wallace River Hatchery from hatchery-origin (marked/clipped) adult Skykomish River Chinook returns.

7.2) Collection or sampling design.

Skykomish summer Chinook eggs will be taken from broodstock returning to the Wallace River Hatchery.

7.3) Identity.

Skykomish Chinook are a hatchery-origin stock derived from the native spawning population in the Skykomish River, and are denoted a such by their unique mark, tag, and otolith status.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

The broodstock collection goal at the WDFW Wallace River Hatchery for the Tulalip Tribal enhancement program is approximately 760 adult Skykomish Chinook, which are projected to yield 1.6 million eyed eggs. Additional summer Chinook broodstock will be collected at the Wallace River Hatchery for on-station releases, requiring a total of 3.5 million green eggs or roughly 1,700 Chinook.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Skykomish River Chinook eyed egg numbers collected and transferred from the Wallace River Hatchery to the Bernie Kai-Kai Gobin Tulalip Tribal Hatchery.

Brood Year	No. Green Eggs Transferred
1998	127,414
1999	200,000
2000	202,050
2001	200,000
2002	200,000

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Please see the WDFW Wallace River Hatchery HGMP.

7.6) Fish transportation and holding methods.

Broodstock for this program return directly to the Wallace River Hatchery, where they will be individually transferred from the river to one of three holding ponds based upon their return timing to the hatchery.

Once spawned, fertilized, and incubated in Heath incubators, the eyed eggs will be shocked, mortalities removed, and the remaining healthy eyed eggs will be transported to the Bernie Kai-Kai Gobin Tulalip Tribal Salmon Hatchery.

7.7) Describe fish health maintenance and sanitation procedures applied.

See the Wallace River Hatchery HGMP

7.8) Disposition of carcasses.

See the Wallace River Hatchery HGMP

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

The risk of fish disease amplification will be minimized by following sanitation, fish health maintenance, and pathogen monitoring guidelines as described in the Salmonid Disease Control Policy of the Fisheries Co-manager's of Washington State (NWIFC and WDFW 1998).

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

See the WDFW HGMP for Wallace River Hatchery for all of Section 8:

8.1) Selection method.

8.2) Males.

8.3) Fertilization.

8.4) Cryopreserved gametes.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

We will receive eyed Skykomish Chinook eggs from the Wallace River Hatchery for this program. Please see the WDFW Wallace River Hatchery HGMP for broodstock and egg survival goals. Currently, 1.7 million green eggs yield 1.6 million eyed eggs at the Wallace River Hatchery (which equates to 94.1% green-to-eyed egg survival). Of the 1.6 million eyed eggs, the Tulalip Tribes' release goal is 1.5 million smolts into Tulalip Bay (equating to a 93.8% eyed egg to smolt survival rate, or an 88.2% green egg-to-smolt survival rate goal).

9.1.2) Cause for, and disposition of surplus egg takes.

Please see the Wallace River hatchery HGMP. No surplus eyed eggs have been transferred to the Tulalip Hatchery.

9.1.3) Loading densities applied during incubation.

The loading density will be 6,000 Chinook eggs per Heath incubation tray.

9.1.4) Incubation conditions.

Eyed Chinook eggs will be incubated on 47-degree Fahrenheit (8.3 degrees C) well water at the Bernie Kai-Kai Gobin Hatchery, except during extended power outages when east fork Tulalip Creek water will be used. In addition, water temperatures will be modified according to a schedule using chillers to apply thermal otolith marks. Both water sources will be at or near oxygen saturation upon entry to Heath stacks and the effluent will be above 90% saturation when it leaves the stacks.

Eyed Chinook eggs received from WDFW for this program will be disinfected in a 100 ppm iodophor solution for ten minutes after they are placed into the Heath incubator trays, before pathogen-free well water is turned on. Green eggs are disinfected for one hour in the same concentration of iodophor.

9.1.5) Ponding.

Skykomish Chinook fry will be ponded when they are at or near to full yolk absorption (near to full button-up). Dates of ponding will vary according to the exact number of thermal temperature units (TU's) accumulated in eyed eggs at the time a particular batch is

transferred from the Wallace River Hatchery.

9.1.6) Fish health maintenance and monitoring.

Eyed eggs will be treated prophylactically in Heath incubators with a 1,667 ppm formalin drip treatment for 15 minutes, three times per week, to control growth of opportunistic *Saprolegnia* sp. fungus. Vexar matting will be placed in the bottom of the Heath trays to provide substrate for alevins to hold in during yolk absorption, which conserves their energy, improves growth and size at emergence, and reduces abrasion of yolk sacs. All dead eggs will be removed from egg lots held at the Wallace River Hatchery after shocking and prior to transfer to Tulalip. No further dead egg removal will be done from this stage until ponding.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

Native stock culture reduces the risk of introducing and amplifying unwanted genetic traits from non-local Chinook populations. Backup water supplies and alarm systems reduce the possibility for hatchery disasters.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

The overall survival rate from spawning to release will be approximately 80 percent.

9.2.2) Density and loading criteria (goals and actual levels).

Juvenile rearing densities will be held under 0.5 pounds of fish per cubic foot of rearing space.

9.2.3) Fish rearing conditions

Before juveniles reach one-half pound of fish per cubic foot of rearing space, they will be transferred into larger outdoor raceways. While being reared in these raceways, approximately 100,000 juvenile summer Chinook will be coded-wire tagged and externally marked with an adipose fin clip. After tagging and marking the 100,000 summer Chinook fingerlings, they will be combined with the remaining summer and fall Chinook and transferred to the lower Tulalip Creek ponds. Rearing densities will remain below one-half pound of fish per cubic foot of rearing space, and conditions will resemble natural habitat, as described in Sections 5.6 and 9.2.9.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

This data is currently being compiled and centrally-located in several databases.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

This data is currently being compiled and centrally-located in several databases.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Feed Type / Size	Fish Size Fish Per Pound (fpp)
BioVita (BioOregon) / Size 0 mash	2700 – 530 fpp
BioVita (BioOregon) / Size 1 crumble	530 – 300 fpp
Nutra Plus (Scredding) / Size 2 crumble	300 – 197 fpp
Nutra Fry (Scredding) / 1.2-1.5 mm pellet	197 – 80 fpp

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Eyed eggs will be treated with an iodiphor treatment at the time they are placed in incubators as previously described. Incubating eggs will be prophylactically treated with a 1,667 ppm formalin drip treatment for 15 minutes, three times per week, to control growth of opportunistic *Saprolegnia* sp. fungus.

Each year, Northwest Indian Fisheries Commission (NWIFC) fish pathologists will screen a representative number of adults returning to Tribal hatcheries for pathogens that may be transmitted to the progeny. The exact number of fish that will be tested from each stock is specified in the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State. The NWIFC pathologists will work with hatchery crews to prevent or minimize pre-spawning mortality of broodfish to maximize egg fertilization and survival.

Preventative care will also be promoted through routine juvenile fish health monitoring. Pathologists will conduct fish health exams at each of the Tribal hatcheries on a monthly basis from emergence until release. Monthly monitoring exams will include an evaluation of rearing conditions as well as sampling small numbers of juveniles to assess their health status and to detect infectious pathogens of concern. Diagnoses will be reported to the Hatchery Managers and the Enhancement Biologist along with any recommendations for

improving or maintaining fish health, and preventing or controlling disease. Vaccines will be administered as necessary to prevent the onset of two bacterial diseases at this hatchery (vibriosis or enteric redmouth disease). Pathologists will work with the Enhancement Biologist, Hatchery Managers and Technicians to ensure that drugs and chemicals will be dispensed properly during treatments. The entire health history for each hatchery stock will be maintained in a relational database called AquaDoc.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Not available.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

All program fish will be transferred to the lower Tulalip Creek pond, a natural earthen pond. They will be held in this pond for a minimum of 30 days prior to release into Tulalip Bay. The characteristics of this pond closely mimic natural rearing conditions, including overhead cover, earthen substrate, natural feed supplementation, in-column structure, natural inflow, natural camouflage coloration/pond color, and presence of natural predators. Program fish will develop natural morphology and behavior, including more natural body coloration, predator avoidance and natural feeding behaviors, by adapting to these natural environmental conditions, which minimizes the influence of the artificial culture environment and is thought to increase their post-release survival.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

Use of native broodstock, proper mating strategies, and natural rearing of juvenile Chinook for a relatively short period (several months to the fingerling stage), minimizes the potential for adverse genetic and ecological effects that may result from the artificial rearing environment.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Fingerling	1,500,000	70-80 fish/lb.	May 5-15	Tulalip Bay

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Tulalip Bay
Release point: Tulalip Creek lower pond
Major watershed: WRIA 7 (Snohomish)
Basin or Region: Puget Sound

10.3) Actual numbers and sizes of fish released by age class through the program.

The first summer Chinook fingerling release was in 1999, from brood year 1998.

Tulalip Hatchery fingerling Skykomish River summer Chinook salmon releases and marking and tagging rates (1999 to 2003).

Brood Year	Release Year	AD/CWT	AD Only	CWT Only	Unmarked and Untagged	TOTAL RELEASED	Percent Ad Clipped	Percent CWT	Percent Marked [1]
1998	1999	105,232	12,083	0	0	117,315	100.0%	89.7%	100.0%
1999	2000	99,251	81,489	0	4,460	185,200	97.6%	53.6%	100.0%
2000	2001	75,003	7,038	1,948	111,011	195,000	42.1%	39.5%	100.0%
2001	2002	92,381	4,643	1,380	90,615	189,019	51.3%	49.6%	100.0%
2002	2003	73,163	18,109	2,563	94,265	188,100	48.5%	40.3%	100.0%
					Averages for all years:	**174,927**	**67.9%**	**54.5%**	**100.0%**
					Release Years '01 - '03 Averages:	**190,706**	**47.3%**	**43.1%**	**100.0%**
					Release Years '99 - '00 Averages:	**151,258**	**98.8%**	**71.6%**	**100.0%**

1. Ad, CWT, + Otolith.

See also: http://www.nwifc.wa.gov/CRAS for tag and mark release numbers for this program.

10.4) Actual dates of release and description of release protocols.

See above.

10.5) Fish transportation procedures, if applicable.

Not applicable. All releases were/will be on-station.

10.6) Acclimation procedures.

A valve from the lower Tulalip Creek pond to Tulalip Bay will be opened during incoming higher high tide. This will allow for several hours of mixing of marine and fresh water prior to Chinook moving from lower Tulalip Creek pond to Tulalip Bay at lower low tide.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All summer Chinook released from the Bernie Kai-Kai Gobin Hatchery have been mass-(otolith) marked since the 1998 brood. All fish that were/will be coded-wire tagged were/will be adipose fin clipped (100,000 annually). A 2003 MOU Agreement (dated June 1, 2003) has been recently signed regarding terms and conditions agreed to by WDFW and the Tulalip Tribes for mass-marking Chinook salmon to be released from the Wallace River Hatchery in the Snohomish River system and from the Bernie Kai-Kai Gobin Hatchery to be released into Tulalip Bay.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Not applicable.

10.9) Fish health certification procedures applied pre-release.

Monthly fish health monitoring exams, as described in section 9.2.7, will be conducted by a fish pathologist from the NWIFC up until the time of release. Fish will be examined within two weeks of their scheduled release. The exam will include an assessment of mortality rate, fish behavior, general condition, and rearing conditions. A necropsy will be performed on representative fish from the population, including moribund and dead fish if these are available. An attempt will be made to determine factors contributing to mortality. Parasites will be routinely screened for by microscopic examination of gills and skin. Bacterial or viral assays may be conducted at the discretion of the pathologist if there is evidence of an infectious disease problem. Depending upon the findings of the exam, a recommendation will be made to either release the fish as planned if they are healthy, or if disease or infectious fish pathogens are present, treatments will be applied as necessary to regain fish health prior to release.

10.10) Emergency release procedures in response to flooding or water system failure.

During hatchery rearing, it is always possible to change or supplement the hatchery water source to protect Chinook stocks under culture. In the event of flooding or water system failure, hatchery personnel have the ability to choose from either well water, west fork, or east fork Tulalip Creek water. Flooding is not an issue at the hatchery or Tulalip Creek pond.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

This is an isolated facility. No anadromous fish inhabit Tulalip Creek. Imprinted fish are released directly into marine waters

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

Note: annual accomplishment of monitoring and evaluation of performance indicators is contingent on availability of funding. As of 2004, most research, monitoring, and evaluation projects have been accomplished primarily through acquiring Hatchery Reform and self-governance funds specifically dedicated for hatchery reform and rehabilitation.

Performance Indicator (Section 1.10)	**Monitoring Plan Objective** (Section 11)	**Methods/Comments** (Section 11)
On average, the estimated survival rate for the hatchery production will remain above 0.005 to provide: • for the recruitment of 10,000 December Age 3 fish, and • an average terminal harvest rate of > 0.95	Overall summer-fall Tulalip Chinook survival rate estimates are available from reconstructed CWT recoveries beginning with brood year 1998.	▪ CWT recoveries will be reviewed and analyzed annually to determine adult equivalent survival rates from this tagging program. We will develop a model to relate terminal area return by age to overall survival by assuming that pre-terminal interception rates equal those for nearby indicator stocks. ▪ Stock and age composition for the terminal area fishery will be determined from weekly sampling of the fishery for scales, CWT's, and otoliths.
The overall survival rate of summer Chinook will not be less than the survival rate for fall Chinook ($p < 0.10$).	Comparative survival rate estimates are available from concurrent summer-fall coded-wire tagging for Tulalip Chinook beginning with brood year 1998.	▪ Coded-wire tagging of 100,000 fingerlings will continue at least through brood year 2007 (10 years total). ▪ All fisheries must be sampled for coded wire tags at appropriate rates (at least 20% sample for net fisheries, at least 10% rate for others). ▪ Otoliths must be collected from at least 100 Chinook salmon per week in the Area 8D fishery for analysis in the laboratory.

Performance Indicator (Section 1.10)	**Monitoring Plan Objective** (Section 11)	**Methods/Comments** (Section 11)
Annual fisheries plans project exploitation rates below the Co-managers' guidelines for Puget Sound Chinook management units.	FRAM or successor model will be used to make annual projections of impacts.	Model inputs estimating impacts of the Area 8D fishery awill be updated annually based upon results of otolith and CWT sampling and analyses (see below for otolith sampling requirement).
Post-season assessments of exploitation rates on natural-origin, listed Stillaguamish and Snohomish Chinook will be below Co-managers' guidelines.	▪ Post-season analysis of coded-wire tags (from indicator stocks), combined with analysis of otoliths collected from Area 8D (from the Tulalip hatchery stock) will be conducted. ▪ Information from concurrent coded-wire tagging of Tulalip summer and fall groups, beginning with brood year 1998, will also be used for this effort when returns are available.	▪ All fisheries must be sampled for coded-wire tags at appropriate rates (at least 20% sampled in net fisheries, at least 10% rate in other fisheries). ▪ Otoliths must be collected from at least 100 Chinook salmon per week in the Area 8D fishery for analysis in the laboratory.
The proportion of Tulalip origin spawners in the natural spawning areas remains below Co-managers' guidelines.	Estimate the annual contribution of Tulalip hatchery Chinook to natural populations such that the upper bound of the 90% confidence interval is 10% contribution when the true contribution rate is 5%.	▪ Mass-mark all Chinook production with otolith marks. ▪ Collect otoliths from at least 100 Chinook carcasses per population per year in the Snohomish and Stillaguamish watersheds for mark detection. ▪ See section 12 below for further information.

Performance Indicator (Section 1.10)	**Monitoring Plan Objective** (Section 11)	**Methods/Comments** (Section 11)
Evaluate the level of interaction of hatchery summer Chinook Tulalip Bay releases with out-migrating natural smolts. Test the hypothesis that the time of peak abundance of Tulalip summer Chinook salmon and naturally-produced salmon in local marine waters do not differ significantly.	Estimate the abundance and the temporal and spatial distribution of natural salmon populations that may be present in Tulalip Bay. Estimate the timing of the natural Chinook smolt out-migration from local rivers.	This requires a new research project to establish the optimum time/area strata for release that would minimize impacts on natural populations. Information from new in-river smolt trapping projects in the Stillaguamish and Snohomish systems will be part of this research.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Please see the preceding Section 11 for M&E projects that are also research projects. In addition, hatchery Chinook otolith marking and recovery M&E and research projects are being conducted, provided funding continues to be available for this, in order to distinguish juvenile and adult hatchery and natural stock components. This has enabled evaluations of stray rates, hatchery and natural escapement estimates (Rawson, Kraemer, and Volk 2001), and ongoing studies of ecological interactions between program Chinook releases and ESA-listed Chinook juveniles. This 100% marking, contingent on funding availability, is an essential complement to ongoing juvenile salmonid monitoring and research efforts in the river, estuary, and nearshore marine areas. It would not be possible to identify the origins of Tulalip Hatchery Chinook without this otolith marking, and proposed mass adipose fin marking will not accomplish this essential identification as to hatchery of origin that is necessary to monitor the production from this program. The tribes and State have active Chinook coded-wire tagging, and adipose fin clipping programs currently in place, which has also been funded through Hatchery Reform.

With adequate funding, the adult Chinook recovery program can continue to be implemented in the Snohomish basin to allow for enumeration of hatchery and natural stock components in the Snohomish Chinook escapement and for evaluations of straying. Annual accomplishment of research projects listed throughout this HGMP is contingent on availability of funding. As of 2004, most research, monitoring, and evaluation projects needed for this program have been accomplished primarily through acquiring Hatchery Reform and BIA self-governance funds specifically dedicated for hatchery reform and rehabilitation.

Project 1. The purpose of the otolith marking and recovery project is to estimate the rate of contribution of natural- and hatchery-origin Tulalip hatchery summer and fall Chinook to the terminal area fishery and to natural and hatchery spawning populations of Chinook salmon in the Snohomish system (Rawson et al. 2001).

Project 2) Juvenile smolt trapping in the Skykomish and Snoqualmie Rivers. Purpose is to annually document demographic, ecological, and biological data (estimate relative abundances, total smolt yields, migration timing, relative size (fork lengths, whole body weights, condition factors), ecological interactions of Chinook and other juvenile salmonids out-migrating from the Snohomish system.

Project 3) Juvenile salmonid utilization of the Snohomish River estuary. The initial purposes of this study were to determine if use of Snohomish River estuarine habitats by juvenile Chinook salmon is correlated to life history type of the fish and attributes of the estuarine habitats. Habitat use is defined by measuring growth rates, diet, distribution, abundance, and habitats used. Life history patterns are indicated by both timing and fish size at estuarine entry, and by origin. Attributes of estuarine habitats include the geographic position of habitat in the estuary, salinity, depth, and velocity. We will obtain information on origin (Snoqualmie vs. Skykomish), timing and size of migration, and estuarine habitat utilized, as well as, a collection of scales and otoliths for comparison with future samples of scales and otoliths from adult returns.

These studies are helping us to better understand and evaluate the level of interaction of hatchery-origin summer Chinook smolts released into Tulalip Bay with natural-origin, juvenile Chinook in estuarine and nearshore habitats.

Information is being gathered on relative out-migration timing, spatial overlap, and relative abundances of Tulalip summer Chinook salmon and naturally-produced Chinook salmon in the Snohomish estuary and nearshore marine areas including Tulalip Bay, which will help to assess the potential for adverse ecological interactions among natural-origin and program Chinook juveniles such as competition or predation, upon release.

Project 4) Contribution of hatchery- and natural-origin Chinook salmon to natural and hatchery spawning areas, ocean and freshwater fisheries, and escapement estimation for the Snohomish basin using coded-wire tagging, fin clipping, and recoveries in fisheries and on spawning grounds.

12.2) Cooperating and funding agencies.

Please see Section 12.1 also regarding the relationship of funding to proposed research, monitoring, and evaluation programs in this HGMP. The Tulalip Tribes provide funding for all projects in this HGMP (adult otolith marking, freshwater smolt trapping, estuarine and nearshore marine trapping and seining, ecological interactions, adipose fin marking,

coded-wire tagging, adult Chinook recovery programs in the Tribal fishery and throughout the Snohomish basin), NOAA fisheries also provide funding for estuarine and nearshore trapping and seining, ecological interactions, and WDFW cooperates in the otolith marking and recovery project, smolt trapping, ecological interactions, adipose fin marking, coded-wire tagging, and adult Chinook recovery programs in the Snohomish basin.

Since project 1 began in 1998, funds have been provided through Pacific Salmon Treaty implementation, Hatchery Reform funding through the NWIFC, and a fishery research grant from NOAA. Some funds from the Tulalip Tribes fishery management contract with the BIA have also supported this project. The WDFW has provided brood stock collection and egg incubation, much of the sample collection effort, and has cooperated in all phases of data analysis and interpretation. The Snohomish Public Utility District has also assisted in collecting otolith samples. NOAA Fisheries and the Tulalip Tribes have funded estuarine and nearshore marine sampling research, BIA Jobs in the Woods funding has supported Tulalip smolt trapping efforts.

12.3) Principal investigator or project supervisor and staff.

Project 1) Otolith marking and monitoring the contribution of hatchery- and natural-origin coho salmon to natural and hatchery spawning areas and escapement estimation for the Snohomish basin using thermal mass-marking of otoliths (proposed new study): Principal Investigator: Kit Rawson, Senior Fishery Management Biologist.
Project Supervisors: Mike Crewson, Kit Rawson (Tulalip Natural Resources / Fisheries Department), Robert Skoog, Richard Young, and technician crew (Tulalip Environmental / Natural Resources Department), and Curt Kraemer and Eric Volk (WDFW).

Project 2) Smolt trapping operations: Kurt Nelson, Brian Kelder, Kit Rawson, Mike Crewson, and technician crew; Tulalip Environmental / Natural Resources Department.

Project 3) Estuarine and nearshore marine environment habitat utilization and species composition studies: Mindy Rowse and Kurt Fresh (NOAA Fisheries), Brian Kelder, Kurt Nelson, Todd Zackey, Mike Crewson, Kit Rawson (Tulalip Environmental / Natural Resources Department).

Project 4) Coded-wire tagging, fin marking, and mark/tag recoveries in fisheries and on hatchery and on natural spawning areas (estimate directed and non-landed fishery mortality, conduct and evaluate DIT and preserve integrity of the coded-wire tagging system, evaluate mark-selective fisheries and impacts on ESA-listed salmon stocks and other natural-origin salmonids, measure run timing, survival rates, migration patterns, and stray rates into other watersheds: Kit Rawson, Marla Maxwell, Mike Crewson, and technician crew (Tulalip Natural Resources/Fisheries Department), Curt Kraemer Doug Hatfield, and Darin Combs, and technician crew (WDFW).

12.3) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Non-listed hatchery stock.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

For Project 1, otoliths of developing embryos will be thermally marked after their eye pigment becomes visible in the eggs while they are held in hatchery incubators, by applying regular patterns of temperature variation in the water. Otoliths will be identifiable as to hatchery of origin and brood year. Otoliths will be extracted from adult fish taken in the terminal area fishery, from carcasses on the spawning grounds, and from hatchery escapement populations. No live fish will be sampled for otoliths. Otoliths will be stored in 95% ethanol and later shipped to the WDFW Otolith Laboratory, where unique marks will be identified using a compound microscope.

Publications, annual reports, draft summary reports, Biological Assessments and Opinions are available with these details for the other projects.

12.6) Dates or time period in which research activity occurs.

Otolith marking will occur during incubation in the hatchery prior to hatching each winter (approximately November-January annually). Fishery sampling will occur from July through September annually. Spawning population sampling will occur from September-October each year. Sampling plans for the other studies were previously described and included in the aforementioned reports and assessment documents.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

Live eyed Chinook eggs will be thermally-marked according to standard methods developed by the WDFW Otolith Laboratory. Thermal marking patterns on otoliths will be made by temporally controlling periods of incubation water temperature change ($\Delta \approx 3.5$ °C), alternated by periods of normal water temperature. Care and maintenance of live fish, eggs, holding durations, transport methods, and other details for the other studies were previously described and included in the aforementioned reports and assessment documents.

12.8) Expected type and effects of take and potential for injury or mortality.

Expected take of listed fish will be minimal to zero by using marked and/or tagged hatchery fish for broodstock. Fishery and hatchery rack sampling involves zero take of listed populations. Spawning ground sampling will be conducted either from rafts, which

have zero mortality, or by foot surveys, which may involve very minimal mortality due to possible disturbance of Chinook redds. Samplers are aware of the location of natural Chinook redds and make every effort to avoid these during sampling of carcasses. Overall mortality to listed populations will be negligible from this project. Expected type and effects of take and potential for injury or mortality for the other studies were previously described and included in the aforementioned reports and assessment documents.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

Negligible, please see above.

12.10) Alternative methods to achieve project objectives.

Not applicable. Conducting no M&E and research actions was the previous alternative, which was rejected and replaced with the Hatchery Reform monitoring projects described above.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Negligible mortality will occur to any species due to these research projects. Negligible mortality of other juvenile salmonids is thoroughly documented in the smolt trapping and estuarine trapping and seining projects.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Samplers conducting foot surveys on the spawning grounds are trained to recognize and avoid natural redds and live fish. Risk aversion measures to minimize adverse effects to listed fish as a result of the proposed research activities were previously described above or in the aforementioned reports and were specified in the assessment documents.

SECTION 13. ATTACHMENTS AND CITATIONS

Puget Sound Salmon Management Plan. 1985. United States vs. Washington. 1606 F. Supp. 1405.

Rawson, K, C. Kramer, and E. Volk. 2001. Estimating the Abundance and Distribution of Locally Hatchery-Produced Chinook Salmon Throughout a Large River System Using Thermal Mass-Marking of Otoliths. NPAFC Technical Report No. 3. Pp. 31-34.

Rawson, K. 2000. Stillaguamish Summer Chinook: Productivity Estimates from Coded-Wire Tag Recoveries and A Simple Model for Setting Interim Exploitation Rate Objectives. Tulalip Fisheries, 7615 Totem Beach Rd., Marysville, WA 98271.

Snohomish Basin Salmonid Recovery Technical Committee. 1999. Initial Snohomish River Basin Chinook Salmon Conservation/Recovery Technical Work Plan. Snohomish County Surface Water Management, 2731 Wetmore Ave. Ste. 300, Everett, WA 98201-3581.

Tulalip Indian Tribes and Washington Department of Fish and Wildlife. 2003. Memorandum of Understanding. Tulalip Indian Tribes, 7515 Totem Beach Road, Tulalip, WA 98271-9714.

Tulalip Indian Tribes and Washington Department of Fish and Wildlife. 1997. Memorandum of Understanding. Tulalip Indian Tribes, 7515 Totem Beach Road, Tulalip, WA 98271-9714.

Tulalip Indian Tribes and Washington Department of Fish and Wildlife. 1981. An Agreement Between the Tulalip Tribes and the Washington Department of Fisheries Concerning the Tulalip Tribes Salmon Hatchery. Tulalip Indian Tribes, 7615 Totem Beach Road, Tulalip, WA 98271-9714.

Washington Department of Fisheries, the Stillaguamish Tribe, and the Tulalip Indian Tribes. 1992. Draft Stillaguamish/Snohomish Equilibrium Brood Document. Tulalip Indian Tribes, 7515 Totem Beach Road, Tulalip, WA 98271-9714.